AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended): A method of joining a pair of metal components comprising the steps of:

(a) placing a first metal component having a first exposed continuous surface and a second metal component having a second exposed surface in overlapping relationship to each other;

(b) providing a metal rivet having a head and a tip opposite the head for entering into the first and second components; and

(c) rotating the rivet about its longitudinal axis and simultaneously plunging the rivet through the first component continuous surface and into the second component, wherein the hardness of the metal rivet is substantially similar to the hardness of at least one of the first and second components, such that the metal of the rivet and the first and second components plastically deform; and

(d) solidifying the plasticized metal to produce a metallurgical bond ~~joint~~ between the rivet and each of the first and second components.

2. (Currently amended): The method of claim 1, wherein the rivet tip is pointed.

3. (Currently amended): The method of claim 2, wherein a final position of the rivet tip is within the second component.

4. (Currently amended): The method of claim 3, wherein the rivet tip raises a portion of the second exposed surface.

5. (Currently amended): The method of claim 4, wherein the raised portion has a semispherical configuration.

6. (Currently amended): The method of claim 4, wherein the first and second components are held together between a clamp positioned on the first exposed surface and a backing anvil positioned against the second exposed surface, wherein the backing anvil defines a recess which receives the raised portion and deforms the raised portion into the configuration of the recess.

7. (Currently amended): The method of claim 2, wherein a final position of the rivet tip is flush with the second exposed surface.

8. (Currently amended): The method of claim 7, wherein the first and second components are held together between a clamp positioned on the first exposed surface and a backing anvil positioned against the second component, wherein the backing anvil has a substantially planar surface against which the rivet abuts to maintain the rivet tip flush with the second exposed surface.

9. (Currently amended): The method of claim 2, wherein a final position of the rivet tip exterior to the second component.

10. (Currently amended): The method of claim 1, wherein at least one of the first and second components is preheated prior to plunging the rivet therein.

11. (Currently amended): The method of claim 1, wherein the rivet defines a helical groove along an exterior surface of the rivet.

12. (Currently amended): The method of claim1, wherein the rivet includes means for hiding flash produced in the step of plunging and rotating the rivet.

13. (Currently amended): The method of claim 12, wherein the rivet includes a flange and a lip extending therefrom, the flange and lip thereby defining a recess for collecting flash between the rivet and the first exposed surface.

14. (Currently amended): The method of claim 1, wherein the rivet tip defines a bore.

15. (Currently amended): The method of claim 14, wherein the bore extends partially through the rivet.

16. (Currently amended): The method of claim 14, wherein the bore extends completely through the rivet.

17. (Currently amended): The method of claim 1, wherein the head of the rivet includes means for engaging another component.

18. (Currently amended): The method of claim 1, further comprising joining a third metal component to the second component by the steps of:

(i) positioning the third component having a third exposed surface in overlapping relationship to the second exposed surface;

(ii) providing another metal rivet having a head and a tip opposite the head for entering into the third and second components; and

(iii) rotating the other rivet about its longitudinal axis and simultaneously plunging the other rivet through the third component exposed surface and into the second component, wherein the hardness of the other metal rivet is substantially similar to the hardness of one of the third and second components.

19. (Currently amended): The method of claim 18, wherein the third exposed surface defines a pilot hole into which the other rivet is positioned prior to step (iii).

20. (Currently amended): The method of claim 18, wherein steps (c) and (iii) are performed simultaneously.

21. (Currently amended): The method of claim 1, further comprising removing the rivet head following step (d).

22. (Currently amended): The method of claim 21, wherein the rivet head is joined to a main portion of the rivet via a narrowed portion such that when the plasticized metal solidifies, the rivet head breaks off at the narrowed portion from the rivet main portion.

23. (Currently amended): The method of claim 1, wherein the first and second metal components and the rivet each comprise aluminum or an aluminum alloy.

24. (Currently amended): The method of claim 23, wherein at least one of the first and second metal components is a clad product.

25. (Previously Amended): A composite metal product produced according to the method of claim 1.

26. (Currently amended): The composite metal product of claim 25, wherein the first metal and second metal components and the rivet each comprise aluminum or an aluminum alloy.

27. (Currently amended): The composite metal product of claim 26, wherein at least one of the first and second metal components is a clad product.

28. (Currently amended): The composite metal product of claim 25, wherein at least about 50% of the alloying components the first and second components and the rivet are the same.

29. (Currently Amended): A system for joining a first metal component to a second metal component with a rivet, wherein the hardness of the rivet is substantially similar to the hardness of at least one of the first and second components, said system comprising:

a clamp positioned on a continuous first exposed surface of the first component for maintaining the first component adjacent the second component;

a backing anvil for supporting a second exposed surface of the second component adjacent the first component; and

means for rotating and plunging the rivet through the continuous first exposed surface and into the second component to produce a region of plasticized metal between the rivet and each of the first and second components, the plasticized metal being solidifiable to form a ~~friction weld~~ metallurgical bond between the rivet and each of the first and second components.

30. (Currently amended): The system of claim 29, further comprising means for removing flash produced when the rivet is friction welded to the first and second components.

metal components and this effect is critical in forming a metallurgical bond between the rivet and components.

No such effects are produced in the method of the Waldron patent, therefore the method of claims 1-4, 7, 9, 25, 26, 28, and 29 define thereover.

With respect to the obviousness rejections of claims 11-18, 20, and 23-29, the secondary references do not account for the deficiencies in the Waldron patent namely, that the rivet has a hardness which is substantially similar to the hardness of at least one of the first and second components and that a metallurgical bond is formed between the components. Hence, claims 11-18, 20, and 23-29 define over the Waldron et al. patent in combination with the Takeshita et al., Martin et al., Thomas et al., Colligan, Aota, Cearlock et al., or Enomoto et al. patents.

The rejection of claim 7 continues to assert that col. 3, lines 54-67 or col. 4, lines 6-32 of Waldron, teaches that the final position of the pointed rivet tip is flush with the second exposed surface. Actually, the passage at col. 3 teaches against extending the fastener tip completely through the second component because the stated goal is to create an "undisturbed metal of the workpiece outside of the weld zone 32". One seeking to maintain undisturbed metal would not extend the rivet tip to the second exposed surface. The head of the fastener (opposite the tip) may be removed to be flush with the upper surface of the first workpiece, but that does not suggest altering the location of the rivet tip. The passage at col. 4 refers to Figs. 1-5 which all show the rivet tip residing completely within the second component. In the absence of any teaching that the final position of the pointed rivet tip is flush with the second exposed surface in the Waldron patent, claim 7 further defines over the prior art of record.

The rejection of claim 13 incorrectly asserts that the Cearlock et al. patent discloses a mechanism for collecting flash between the rivet and the first exposed surface. In fact, the Cearlock et al. patent shows a projection 19 on the tool 10 (not on a fastener) which rotates and removes flash. There is no recess formed by the fastener 42 that collects flash between the rivet and an exposed surface. Accordingly, claim 13 defines over the prior art of record.

In view of the foregoing, claims 1-32 are believed to define over the prior art of record and be in condition for allowance. Reconsideration of the rejections and allowance of all of claims 1-32 are respectfully requested.

Respectfully submitted,

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31. (Currently amended): The system of claim 29, [where] wherein said means for removing flash comprises a moveable member linked to said means for rotating, said moveable member configured to move about the rivet to remove the flash.

32. (Currently amended): The system of claim 31, wherein said rotating means is disengagable from the rivet to allow the friction weld to solidify while said moveable member continues to move about the rivet.